WHAT IS CLAIMED IS:

1. An apparatus for plurality signal generation, comprising:

a digital baseband generator that generates a digital baseband input signal,

a controller that receives and processes the digital baseband signal to generate at least one time delayed, gain adjusted driving signal;

a reference RF up-converter that converts a first one of the driving signals to a desired RF reference signal;

a predistortion RF up-converter that combines a second one of the driving signals with a predistortion signal and converts the combined pre-distorted signal to a RF predistortion signal;

an amplifier that amplifies the RF predistortion signal;

a comparator that compares a sample of the RF predistortion signal with the RF reference signal and outputs an error signal corresponding to the comparison;

a wide-band feed forward loop that amplifies the error signal and combines, in anti-phase, the amplified error signal with the amplified RF predistortion signal to produce an output signal;

a measurement RF down-converter that samples and measures the error signal to provide a corresponding digital sampled error signal to the controller; and

an adaptive estimator processor operatively coupled to the controller to estimate the performance of the apparatus by comparing the measured error signal with a delayed copy of the input signal and provide estimate information to the controller to support adaptive updating of the controller.

2. The apparatus of claim 1, further comprising an output sampler that samples the output signal, an error sampler that samples the error signal and a RF-switch that selectively provides each of the sampled output and error signals to the measurement RF converter.

3. The apparatus of claim 1, wherein the predistortion RF up-converter comprises correction circuitry, the correction circuitry including:

respective I and Q digital multipliers that multiply digital I and Q signals representing the second one of the driving signals by respective gain correction factors;

a phase rotator that multiplies the digital I and Q signals by a phase rotation correction vector;

respective I and Q FIR filters that correct frequency response errors in the digital I and Q signals;

respective I and Q summers that adjust a DC offset of the digital I and Q signals;

respective I and Q DACs that convert the digital I and Q signals to respective first and second analog signals;

respective LPFs that filter the first and second orthogonal analog signals; and

an analog modulator that combines and modulates the first and second signals to provide an analog predistortion signal.

4. The apparatus of claim 1, wherein the measurement RF down-converter comprises correction circuitry, the correction circuitry including:

an analog demodulator that demodulates the sampled output signal and provides first and second orthogonal analog signals;

respective LPFs that filter the first and second analog signals;

respective I and Q ADCs that convert the first and second analog signals to respective digital I and Q signals;

respective I and Q digital multipliers that multiply digital I and Q signals by respective gain correction factors;

a phase rotator that multiplies the digital I and Q signals by a phase rotation correction vector;

respective I and Q FIR filters that correct frequency response errors in the digital I and Q signals; and

respective I and Q summers that adjust a DC offset of the digital I and Q signals.

5. The apparatus of claim 1, wherein the predistortion RF up-converter includes active IF LO-cancellation circuitry.

6. The apparatus of claim 3, wherein the RF-switch includes an external calibration port .

7. The apparatus of claim 1, wherein a pilot tone signal is added to the

second driving signal at the controller, the pilot tone signal also being sampled and sent to the adaptive estimator processor by the controller, the adaptive estimator processor receives a sample of the output signal, performs a synchronized detection of the pilot signal, and uses the detected information to adjust the wide-band feed forward loop.

8. The apparatus of claim 5, wherein the predistortion RF up-converter and the measurement RF down-converter include active RF LO-cancellation circuitry.

9. The apparatus of claim 1, wherein the predistortion RF up-converter and the measurement RF down-converter include adjustable attenuators.

10. The apparatus of claim 1, wherein the predistortion RF up-converter and the measurement RF down-converter operate at different RF-frequencies.

11. An apparatus for plurality signal generation, comprising:

a digital baseband generator that generates a digital baseband input signal,

a controller that receives and processes the digital baseband signal to generate at least one time delayed, gain adjusted driving signal, said controller including at least one serial programmable interface port that controls frequency settings of PLL synthesizer circuits, DAC and ADC clock's, gain setting blocks and digitally controlled gain/phase adjuster to apply optimum adjustment of analog error canceling in the apparatus;

a reference RF up-converter that converts a first one of the driving signals to a desired RF reference signal;

a predistortion RF up-converter that combines a second one of the driving signals with a predistortion signal and converts the combined pre-distorted signal to a RF predistortion signal;

an amplifier that amplifies the RF predistortion signal;

a comparator that compares a sample of the RF predistortion signal with the RF reference signal and outputs an error signal corresponding to the comparison;

a wide-band feed forward loop that amplifies the error signal and combines, in anti-phase, the amplified error signal with the amplified RF predistortion signal to produce an output signal;

a measurement RF down-converter that samples and measures the error signal to provide a corresponding digital sampled error signal to the controller; and

an adaptive estimator processor operatively coupled to the controller to estimate the performance of the apparatus by comparing the measured error signal with a delayed copy of the input signal and provide estimate information to the controller to support adaptive updating of the controller.

12. The apparatus of claim 11, wherein the controller includes a compensation FIR filter that compensates for linear complex gain variation in the reference up-converter, the compensation FIR filter reading filter coefficients from a look up table.

13. The apparatus of claim 11, wherein the controller includes a compensation FIR filter that compensates for flat frequency response in the measurement down-converter, the compensation FIR filter reading filter coefficients from a look up table.

14. The apparatus of claim 12, wherein, for reference up-converter calibration, the reference up-converter is tuned to the midpoint of the used RF-band by adjusting an associated RF local oscillator and generating a digital frequency-stepped stimuli signal through the reference up-converter, which is individually tuned by an RF-local oscillator setting and stepped in equal frequency steps over an intended frequency range, input signal I/Q-data and the measured I/Q- data being provided to the controller where time equalization and I/Q-correction is performed, DC-offsets are estimated, and signal processing is performed to provide data to the compensation FIR to correct for errors introduced in the reference up-converter.

15. The apparatus of claim 13, wherein, for measurement down-converter calibration, the controller generates a single carrier stimuli signal at a fixed RF-frequency through the reference up-converter, the single carrier stimuli signal measured by the measurement down-converter, which is individually tuned by an RF-local oscillator setting and stepped in equal frequency steps over an intended frequency range, input signal I/Q-data and the measured I/Q- data being provided to the controller

where time equalization and I/Q-correction is performed, DC-offsets are estimated, and signal processing is performed to provide data to the compensation FIR to correct for errors introduced in the measurement down-converter.

16. The apparatus of claim 11 further comprising an output sampler that samples the output signal, an error sampler that samples the error signal and a RF-switch that selectively provides each of the sampled output and error signals to the measurement RF converter.

17. The apparatus of claim 11, wherein the predistortion RF up-converter comprises correction circuitry, the correction circuitry including:

respective I and Q digital multipliers that multiply digital I and Q signals representing the second one of the driving signals by respective gain correction factors;

a phase rotator that multiplies the digital I and Q signals by a phase rotation correction vector;

respective I and Q FIR filters that correct frequency response errors in the digital I and Q signals;

respective I and Q summers that adjust a DC offset of the digital I and Q signals;

respective I and Q DACs that convert the digital I and Q signals to respective first and second analog signals;

respective LPFs that filter the first and second orthogonal analog signals; and

an analog modulator that combines and modulates the first and second signals to provide an analog predistortion signal.

18. The apparatus of claim 11, wherein the measurement RF down-converter comprises correction circuitry, the correction circuitry including:

an analog demodulator that demodulates the sampled output signal and provides first and second orthogonal analog signals;

respective LPFs that filter the first and second analog signals;

respective I and Q ADCs that convert the first and second analog signals to respective digital I and Q signals;

respective I and Q digital multipliers that multiply digital I and Q signals by respective gain correction factors;

a phase rotator that multiplies the digital I and Q signals by a phase rotation correction vector;

respective I and Q FIR filters that correct frequency response errors in the digital I and Q signals; and

respective I and Q summers that adjust a DC offset of the digital I and Q signals.

19. The apparatus of claim 11, wherein the predistortion RF up-converter includes active IF LO-cancellation circuitry.

20. The apparatus of claim 19, wherein the predistortion RF up-converter and the measurement RF down-converter include active RF LO-cancellation circuitry.

21. The apparatus of claim 11, wherein the predistortion RF up-converter and the measurement RF down-converter include adjustable attenuators.

22. The apparatus of claim 11, wherein the predistortion RF up-converter and the measurement RF down-converter operate at different RF-frequencies.